

## CLAIMS:

What is claimed is:

- 1 1. A reduced sensitivity spin valve sensor apparatus,  
2 comprising:  
3 a spin valve sensor; and  
4 at least one magnetic effect inducing device,  
5 wherein the at least one magnetic effect inducing device  
6 induces a magnetic field to the spin valve sensor to  
7 thereby reduce a sensitivity of a free layer of the spin  
8 valve sensor to applied magnetic fields
- 1 2. The reduced sensitivity spin valve sensor apparatus  
2 of claim 1, wherein the at least one magnetic effect  
3 inducing device is at least one permanent magnet.
- 1 3. The reduced sensitivity spin valve sensor apparatus  
2 of claim 1, wherein the at least one magnetic effect  
3 inducing device is a pair of permanent magnet stabilizing  
4 elements.
- 1 4. The reduced sensitivity spin valve sensor apparatus  
2 of claim 1, wherein the at least one magnetic effect  
3 inducing device is magnetized in a longitudinal direction  
4 parallel to the free layer of the spin valve sensor.
- 1 5. The reduced sensitivity spin valve sensor apparatus  
2 of claim 3, wherein the permanent magnet stabilizing  
3 elements are cobalt-platinum/chromium magnets.

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1 11. A method of making a reduced sensitivity spin valve  
2 sensor apparatus, comprising:  
3 providing a spin valve sensor; and

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4 providing at least one magnetic effect inducing  
5 device, wherein the at least one magnetic effect inducing  
6 device induces a magnetic field to the spin valve sensor  
7 to thereby reduce a sensitivity of a free layer of the  
8 spin valve sensor to applied magnetic fields.

1 12. The method of making a reduced sensitivity spin  
2 valve sensor apparatus of claim 11, wherein the at least  
3 one magnetic effect inducing device is at least one  
4 permanent magnet.

1 13. The method of making a reduced sensitivity spin  
2 valve sensor apparatus of claim 11, wherein the at least  
3 one magnetic effect inducing device is a pair of  
4 permanent magnet stabilizing elements.

1 14. The method of making a reduced sensitivity spin  
2 valve sensor apparatus of claim 11, wherein the at least  
3 one magnetic effect inducing device is magnetized in a  
4 longitudinal direction parallel to the free layer of the  
5 spin valve sensor.

1 15. The method of making a reduced sensitivity spin  
2 valve sensor apparatus of claim 13, wherein the permanent  
3 magnet stabilizing elements are cobalt-platinum/chromium  
4 magnets.

1 16. The method of making a reduced sensitivity spin  
2 valve sensor apparatus of claim 11, wherein the at least

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3 one magnetic effect inducing device reduces the spin  
4 valve sensor's propensity to saturate.

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1 17. The method of making a reduced sensitivity spin  
2 valve sensor apparatus of claim 11, wherein the at least  
3 one magnetic effect inducing device is an antiferromagnet  
4 layer.

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1 18. The method of making a reduced sensitivity spin  
2 valve sensor apparatus of claim 17, wherein the  
3 antiferromagnet layer aligns atomic moments in the free  
4 layer of the spin valve sensor.

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1 19. The method of making a reduced sensitivity spin  
2 valve sensor apparatus of claim 18, wherein the aligned  
3 atomic moments generate a longitudinal exchange induced  
4 bias field in the free layer that reduces the sensitivity  
5 of the free layer to applied magnetic fields.

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1 20. The method of making a reduced sensitivity spin  
2 valve sensor apparatus of claim 11, further comprising:  
3 providing at least one insulating film; and  
4 providing at least one magnetic shield, wherein the  
5 insulating film is one of alumina, silicon nitride and  
6 aluminum nitride.

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1 21. The reduced sensitivity spin valve sensor apparatus  
2 of claim 1, wherein the at least one magnetic effect  
3 inducing device includes a pair of antiferromagnetic  
4 layers.

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1 22. The reduced sensitivity spin valve sensor apparatus  
2 of claim 21, wherein the pair of antiferromagnetic layers  
3 includes an antiferromagnetic layer that pins a  
4 ferromagnetic layer at zero degrees relative to a long  
5 axis of the free layer.

1 23. The reduced sensitivity spin valve sensor apparatus  
2 of claim 21, wherein the pair of antiferromagnetic layers  
3 includes an antiferromagnetic layer that pins a  
4 ferromagnetic layer at ninety degrees relative to a long  
5 axis of the free layer.

1 24. The reduced sensitivity spin valve sensor apparatus  
2 of claim 21, wherein the pair of antiferromagnet layers  
3 includes a first antiferromagnet layer pinned at zero  
4 degrees relative to a long axis of the free layer, and a  
5 second antiferromagnet layer pinned at ninety degrees  
6 relative to the long axis of the free layer.

1 25. The reduced sensitivity spin valve sensor apparatus  
2 of claim 24, wherein the first and second  
3 antiferromagnetic layers have different blocking  
4 temperatures.

1 26. The reduced sensitivity spin valve sensor apparatus  
2 of claim 21, further comprising a ferromagnetic layer  
3 spaced from the free layer by a nonmagnetic layer.

1 27. The reduced sensitivity spin valve sensor apparatus  
2 of claim 26, wherein a thickness of the nonmagnetic layer

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3 is used to control an amount of ferromagnetic exchange  
4 between the ferromagnetic layer and the free layer.

1 28. The reduced sensitivity spin valve sensor apparatus  
2 of claim 27, wherein the thickness of the nonmagnetic  
3 layer is approximately between 10 and 25 Angstroms.

1 29. The method of claim 11, wherein the at least one  
2 magnetic effect inducing device is a pair of  
3 antiferromagnetic layers.

1 30. The reduced sensitivity spin valve sensor apparatus  
2 of claim 29, wherein the pair of antiferromagnetic layers  
3 includes an antiferromagnetic layer that pins a  
4 ferromagnetic layer at zero degrees relative to a long  
5 axis of the free layer.

1 31. The reduced sensitivity spin valve sensor apparatus  
2 of claim 29, wherein the pair of antiferromagnetic layers  
3 includes an antiferromagnetic layer that pins a  
4 ferromagnetic layer at ninety degrees relative to a long  
5 axis of the free layer.

1 32. The reduced sensitivity spin valve sensor apparatus  
2 of claim 29, wherein the pair of antiferromagnetic layers  
3 includes a first antiferromagnetic layer that pins a  
4 first ferromagnetic layer at zero degrees relative to a  
5 long axis of the free layer, and a second  
6 antiferromagnetic layer that pins a second ferromagnetic

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7 layer at ninety degrees relative to the long axis of the  
8 free layer.

1 33. The reduced sensitivity spin valve sensor apparatus  
2 of claim 32, wherein the first and second  
3 antiferromagnetic layers have different blocking  
4 temperatures.

1 34. The reduced sensitivity spin valve sensor apparatus  
2 of claim 11, further comprising a ferromagnetic layer  
3 spaced from the free layer by a nonmagnetic layer.

1 35. The reduced sensitivity spin valve sensor apparatus  
2 of claim 34, wherein a thickness of the nonmagnetic layer  
3 is used to control an amount of ferromagnetic exchange  
4 between the ferromagnetic layer and the free layer.

1 36. The reduced sensitivity spin valve sensor apparatus  
2 of claim 35, wherein the thickness of the nonmagnetic  
3 layer is approximately between 10 and 25 Angstroms.

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